

## PATENT SPECIFICATION



Application Date : Sept. 24, 1925. No. 23,888 / 25.

260,731

Complete Left : June 24, 1926.

Complete Accepted : Nov. 11, 1926.

## PROVISIONAL SPECIFICATION.

## Improvements in or relating to Electrical Transformers.

We, IGRANIC ELECTRIC COMPANY, LIMITED, a British company, of 147, Queen Victoria Street, London, E.C. 4, and ARTHUR HERBERT CURTIS, a British subject, of "Caramore", Chaucer Road, Bedford, in the County of Bedford, do hereby declare the nature of this invention to be as follows:—

This invention relates to electrical transformers and has for its object the provision of an improved electrical transformer which will be particularly useful in radio receiving apparatus.

The invention consists broadly of an electrical transformer the core of which is made of iron together with another metal, the quantity of iron therein being preferably the minimum amount which is sufficient to produce the maximum efficiency by virtue of its economic use in relation to the amount of copper used in the transformer windings.

In accordance with one embodiment of the invention the primary and secondary windings are located end to end, the primary winding being located in the middle and the secondary winding comprising two sections disposed one each end of said primary winding.

The core consists of a number of wires or laminations threaded through these windings and turned back and joined at the outside of said windings so as to form a path for the magnetic circuit. These wires or laminations are packed tightly within the central space surrounded by the windings so as to fill it as completely as possible, but outside this central space they spread somewhat so that in end elevation the core presents a fan-like appearance. In some cases it may not be possible to assemble the core by actually threading the wires or laminations

through the windings as is customary in the hedgehog type of transformer, and in such cases it is proposed to form the core outside the windings in the desired shape, maintain it in form by injecting moulding material, into the interstices, and then cut it into two halves in a plane of division which will coincide with the mid plane of the centre winding when the core is in situ. These halves may obviously be assembled from the two ends of the windings. The cooperating surfaces of the halves are ground flat so that there is no magnetic leakage at the butt joint formed between them.

The wires or laminations are made of magnetic material of very high permeability such as nickel iron alloy containing say 40% nickel approximately 60% of iron.

The transformer windings together with the magnetic core are contained in a housing formed to fit closely the configuration of the transformer proper formed by said windings and core and thus maintain the parts in situ and press the two halves of the core tightly together. This housing is formed in two halves also having their plane of division coincident with the mid plane of the centre winding, said halves being each constituted by a single moulding and being held together by means of suitable bolts. This housing may carry the necessary terminals and be formed with feet for mounting the complete structure.

Dated this 24th day of September, 1925.

A. A. THORNTON,  
Chartered Patent Agent,  
Quality Court, Chancery Lane, London,  
W.C. 2,  
For the Applicants.

[Price 1/-]

Price 4s 6d

## COMPLETE SPECIFICATION.

## Improvements in or relating to Electrical Transformers.

We, IGRANIC ELECTRIC COMPANY, LIMITED, a British company, of 147, Queen Victoria Street, London, E.C. 4, and ARTHUR HERBERT CURTIS, a British subject, of Caramore, Chaucer Road, Bedford, in the County of Bedford, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to electrical transformers and refers more particularly to electrical transformers of the kind comprising a longitudinally stranded core forming a closed magnetic circuit through, and round the outside of, the coils, and divided into two portions in a plane cutting said magnetic circuit twice, whereby said core may be readily assembled with, and disassembled from, the windings.

The object of the invention is the provision of an improved electrical transformer of this kind and the invention consists broadly in the arrangement according to which the strands forming said core are held in place by being embedded in a suitable binding material, which binding material is divided into two portions in the same plane which divides the core.

Preferably said strands consist each of a single loop of wire and said binding material consist of a moulding in the form of a closed ended hollow cylinder with a central column extending coaxially between the closed ends, said column embedding the strand portions which pass through the central space enclosed by the coils and the walls of said closed ended hollow cylinder embedding the strand portions which pass round the outside of the coils.

The invention will be better understood from the following description with reference to the accompanying drawings wherein:—

Figure 1 is a sectional elevation of one portion of the core together with a moulding in which said portion is embedded, of a transformer in accordance with the invention.

Figure 2 is a plan of the same.

Figure 3 is an elevation shown half in section of the complete transformer.

Referring to the drawings the transformer therein illustrated comprises a

primary winding 1, a secondary winding 2 and a core 3. As shown the primary winding consists of a single coil and the secondary winding consists of two coils located coaxially one each end of said primary winding. The core consists of a number of nickel iron wire loops of more or less rectangular formation passing through the central space enclosed by the coils and round outside the coils as shown. Thus the core forms a closed path for the magnetic circuit of the coils. The wire loops are completely embedded in a moulding 4 in the form of a closed ended hollow cylinder with a central column extending coaxially between the closed ends. The central column embeds the portions of said loops which pass through the central space enclosed by the coils and the closed ended hollow cylinder embeds in its walls the portions of said loops which pass round the outside of the coils. In the transformer illustrated, the portions of said loops which are embedded in the annular wall of said closed ended hollow cylinder together form a complete annulus of single wire thickness but of course the dimensions might be such that said portions form an annulus of more than single wire thickness or that they form less than a complete annulus. Moreover in some cases it may be preferred for said portions to form less than a complete annulus of more than single wire thickness.

The whole unit comprising the moulding 4 and the core 3 embedded therein is made in two portions the dividing plane of which is coincident with the mid plane of the primary winding 1. For the joining of these portions together the two portions of the moulding are formed with respective flanges 4a so that said two portions may be connected by means of bolts 5 passing through said flanges 4a. Before said portions are joined together the engaging surfaces thereof are ground flat so that the separate halves of the wire loops will come together to reform substantially perfect loops from which there will be substantially no magnetic leakage. The four terminals of the transformer are respectively carried by four of said bolts 5.

The moulding 4 may be provided with feet such as those indicated in dotted lines at 4b.

The quantity of iron in the nickel iron

wire is preferably the minimum amount which is sufficient to produce the maximum efficiency by virtue of its economic use in relation to the copper used in the transformer windings. The proportion  
5 may be say 40% nickel and 60% iron.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to  
10 be performed, we declare that what we claim is:—

1. An electrical transformer of the kind comprising a longitudinally stranded core forming a closed magnetic circuit  
15 through, and round the outside of, the coils, and divided into two portions in a plane cutting said magnetic circuit twice, wherein the strands forming said core are held in place by being embedded in a  
20 suitable binding material, which binding material is divided into two portions in the same plane which divides the core.

2. An electrical transformer according to Claim 1, wherein said strands consist  
25 each of a single loop of wire and said binding material consists of a moulding in the form of a closed ended hollow cylinder with a central column extending coaxially between the closed ends, said  
30 column embedding the strand portions which pass through the central space enclosed by the coils and the walls of said closed ended hollow cylinder embedding

the strand portions which pass round the outside of the coils.

3. An electrical transformer according to Claim 2, wherein the two portions of said moulding together with the strand portions embedded therein are secured together by means of bolts or the like  
40 passing through flanges formed on said two portions.

4. The method of constructing an electrical transformer according to Claim 2, wherein the two portions of said mould-  
45 ing, together with the core portions embedded therein have their engaging surfaces ground flat so that when said portions are secured together the separate halves of the wire loops come together to  
50 reform substantially perfect loops from which there will be substantially no magnetic leakage.

5. An electrical transformer substantially as herein specified with reference  
55 to the accompanying drawings.

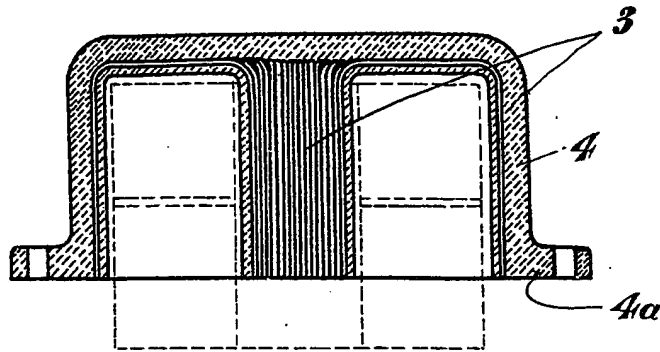
6. A method of constructing an electrical transformer substantially as herein specified with reference to the accom-  
60 panying drawings.

Dated this 24th day of June, 1926.

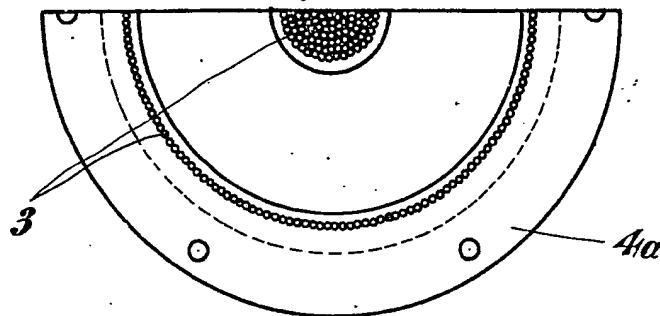
A. A. THORNTON,  
Chartered Patent Agent,  
Quality Court, Chancery Lane, London,  
W.C. 2,  
65 For the Applicants.



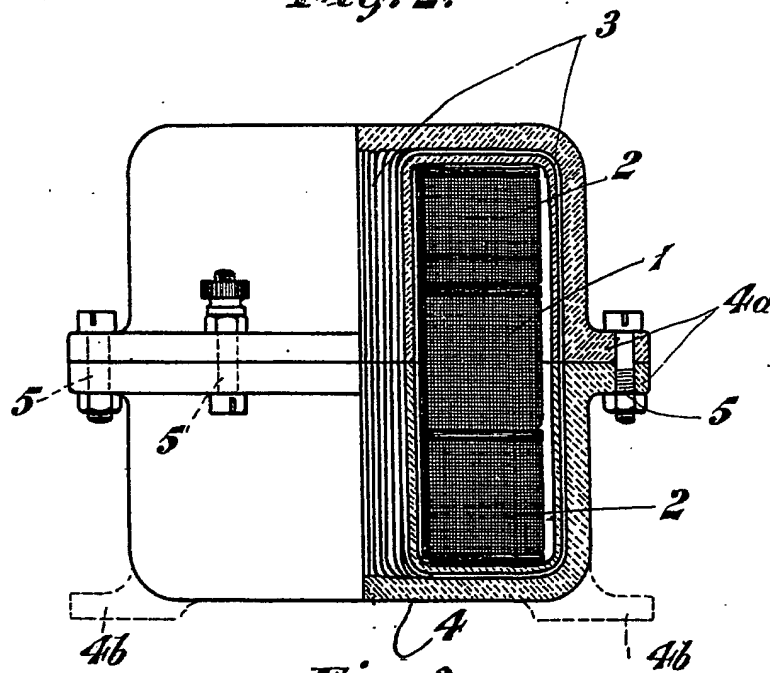
[This Drawing is a reproduction of the Original on a reduced scale.]



*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

Charles & Read Ltd. Photo Litho.